Trend Study 17-49-05

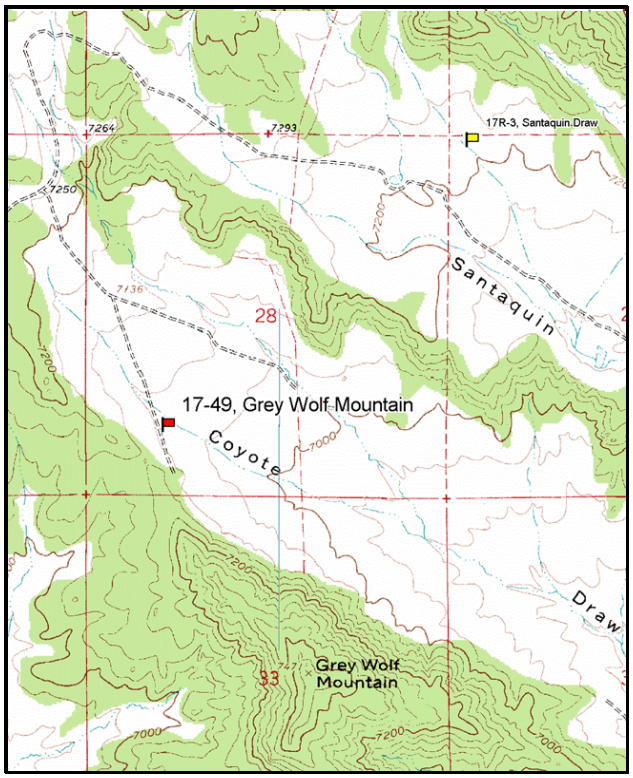
Study site name: Grey Wolf Mountain . Vegetation type: Wyoming Big Sagebrush .

Compass bearing: frequency baseline 97 degrees magnetic.

Frequency belt placement: line 1 (15 & 96ft), line 2 (39ft), line 3 (52ft), line 4 (66ft).

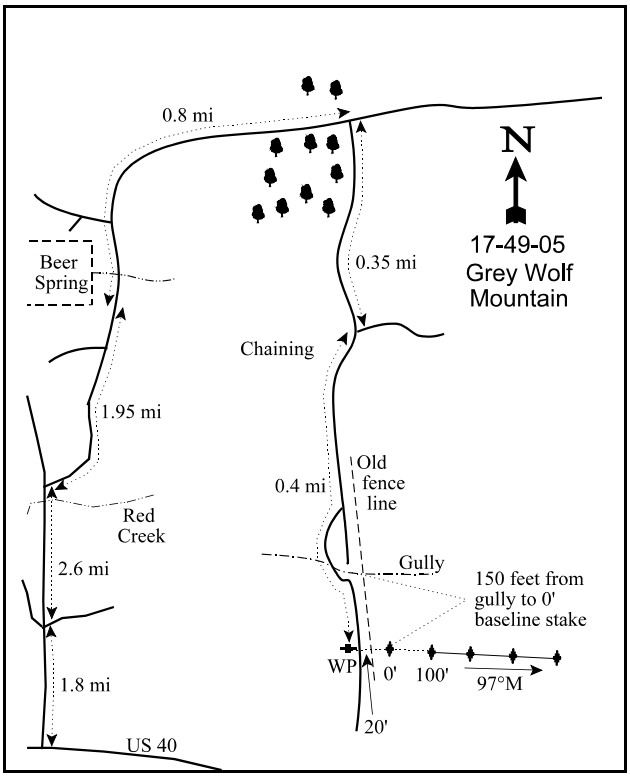
LOCATION DESCRIPTION

From U.S. 40 in Fruitland, travel north up the Red Creek Road 1.8 miles to a 3-way fork. Take the middle fork and go 2.6 miles. After crossing Red Creek, turn right onto a dirt road. Proceed northeast on this road for 1.95 miles to Beer Spring, and the fork to Study 17-51-00. From the southwest corner of the fenced spring bear right and continue for 0.8 miles. Turn right and go 0.35 miles. Stay right and go 0.4 miles going around the gully to an old fence line to a witness post on the right. The 0-foot stake is 20 feet east of the witness. It may not be possible to drive across the deep gully. The start of the baseline is approximately 150 feet south of the gully. The 0-foot baseline stake, a green, short fencepost, is marked by browse tag #7090.



Map Name: Tabby Mountain

Township 2S , Range 8W , Section 28



Diagrammatic Sketch

GPS: NAD 27, UTM 12T 4457860 N, 517197 E

DISCUSSION

Grey Wolf Mountain - Trend Study No. 17-49

The Grey Wolf Mountain trend study is located at the north end of Grey Wolf Mountain at an elevation of approximately 7,080 feet, near the head of Coyote Draw. The slope is less than 5% with an east aspect. The trend study replaced a line-intercept study established in 1981. The land is administered by the Utah Division of Wildlife Resource as part of the Tabby Mountain WMA in an area which is utilized as winter range by both deer and elk. The area was disked on contour and seeded in the fall of 1990 as a habitat and watershed improvement project. Livestock grazing was removed after the treatment. Cattle and horses grazed the area previous to the treatment and use was reported heavy in 1988. Numerous trespassing cattle have been observed in the area during past readings. Pellet group data from 2000 were estimated at 34 deer, 13 elk, and 6 cow days use/acre (84 ddu/ha, 32 edu/ha and 15 cdu/ha). Deer and elk pellet groups appear to be primarily from winter use. In 2005, pellet group data estimates were 58 deer, 47 elk, and 15 cow days use/acre (144 ddu/ha, 116 edu/ha, and 36 cdu/ha).

Soils are alluvially deposited and of considerable depth. The effective rooting depth was estimated at just over 15 inches. There is little rock in the soil profile and soil depth measurements were limited only by soil compaction. Soil texture is a clay loam with a slightly alkaline soil reaction (pH of 7.5). Phosphorus was measured at only 3.6 ppm and values less than 6 ppm may limit normal plant growth and development in wildland soils (Tiedemann and Lopez 2004). Protective ground cover has been poor in the past, consisting mostly of old mature sagebrush cover. The relative cover of bare ground has remained around 50%. There is evidence of some overland flow between shrubs and rills, which feed into a large (10' to 12' deep) active gully northeast of the site, are beginning to form. The only factor preventing increased erosion is the cover provided by herbaceous vegetation. The erosion index measurement in 2005 rated the soil erosion as slight, mainly because of small pedestals surrounding shrubs and perennial grasses, gullies covering 2-5% of the site, some minor soil movement, minor litter movement, as well as small rills and flow patterns between perennial species.

The key browse species is Wyoming big sagebrush. There appears to be some hybridization with mountain big sagebrush and basin big sagebrush since some of the sagebrush display characteristics of both these subspecies. For this report, to help alleviate any confusion, all the sagebrush encountered on the study was classified as Wyoming big sagebrush. These shrubs vary considerably in color, size, growth form, and degree of hedging. Typically, the Wyoming big sagebrush occurs more in the flat and the basin big sagebrush type occurs more along the gullies with deeper soils. Wyoming big sagebrush had an estimated density of 1,265 plants/acre in 1982, most of which were mature. By 1988, the density had increased to 6,466 plants/acre due to a dramatic increase in the number of young shrubs (4,733 plants/acre). Since the disking (thinning) in 1990, shrub densities have fluctuated from 2,300 plants/acre in 1995, to 2,800 in 2000, to 1,960 in 2005. The young population has slowly decreased from 45% in 1995, to 29% in 2000, to 9% of the population by 2005. The decadence was very low in 1982 (5%) and 1988 (3%). It has since increased gradually to 10% in 1995, 13% in 2000, and 19% in 2005. Use was light to moderate from 1982 through 1995. Use in 2000 and 2005 was moderate to heavy. Even with the increased heavy use, vigor remained normal on all but 1% of the individuals in 2000 and 8% in 2005.

Small populations of winterfat, fourwing saltbush, and rubber rabbitbrush provide a limited amount of additional forage for wintering big game. Corymbed eriogonum is also fairly abundant. The undesirable increaser, narrowleaf low rabbitbrush, has provided between one-fourth to one-third of the shrub cover with a fairly stable population since 1988.

Before treatment, the herbaceous understory consisted of crested wheatgrass and a few forbs. Crested wheatgrass was reported to be heavily utilized in both 1982 and 1988. As a result of use and competition, vigor was reduced. After the disking treatment, crested wheatgrass declined significantly in nested frequency, but it continues to be the most abundant grass and accounted for 9% cover in 1995, 17% in 2000, and 20% in 2005. Several other grasses were encountered yet all occur in small numbers. Forbs were also more abundant after treatment with 19 perennial species sampled in 1995 with a cover of 8%. Useful species include Lewis flax, yellow sweet clover, low penstemon and scarlet globemallow. Due to drought conditions, cover and frequency of forbs declined from 1995 to 2000 and still had not recovered by 2005.

1982 APPARENT TREND ASSESSMENT

Trend is difficult to evaluate. Based on soil loss, the percentage of bare ground and the trampling effect of livestock, soil trend is probably slightly downward. However, from a management standpoint, this may be an acceptable trade-off if shrub density and composition can be improved. A rather speculative estimate of vegetation trend is stable to slowly improving. The apparent increase in the key species is encouraging, especially if increases of low rabbitbrush can be limited or avoided.

1988 TREND ASSESSMENT

Trend for soil is stable yet in poor condition. A large amount of bare soil remains exposed, 50% of the ground surface. Litter cover is poor and severe gullying continues in Coyote Draw which is adjacent to the site. With reduced grass vigor and litter build-up, there is accelerated soil loss from the flat. Trend for the key browse species is up. Sagebrush density has gone from 1,265 plants/acre to 6,466 plants/acre. The density of mature plants is similar between years, with a moderate density of 1,533 mature plants/acre. The large increase in sagebrush density occurred because of the number of young plants. Sagebrush has increased from 18% to 44% of the browse composition. Overall, use remains moderate and vigor is fair. Annual growth and seed production were low this year. Density of undesirable browse species has increased since 1982. Trend for the herbaceous understory is slightly up with an increase in quadrat frequency of grasses and forbs.

TREND ASSESSMENT
soil - stable (0)
browse - up (+2)
herbaceous understory - slightly up (+1)

1995 TREND ASSESSMENT

Since the contoured thinning treatment of sagebrush, percent bare ground has increased from 50% to 54%. Litter cover also declined from 36% to 22%, but the litter is more evenly distributed. Even with these negative changes, sum of nested frequency of grasses and forbs increased providing much better soil protection. No erosion was reported in 1995 and trend for soil is considered stable. The browse trend is stable. Even though total density of Wyoming big sagebrush declined substantially, the number of mature plants remained similar to previous years. The disking treatment thinned the population and eliminated most of the older plants. The remaining stand has better vigor and is less heavily hedged. Percent decadence is still low at 10%. Trend for the herbaceous understory is up slightly. Sum of nested frequency for grasses increased slightly, but more importantly, composition improved with 7 new perennial grass species being sampled. The sum of nested frequency for forbs increased with significant increases in 15 of the 20 perennial species sampled in 1995. The Desirable Components Index rated this site as fair with a score of 34 due to low browse cover, low decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - slightly up (+1)
winter range condition (DC Index) - fair (34) Lower Potential scale

2000 TREND ASSESSMENT

Trend for soil is stable with a slight increase in relative percent cover of vegetation and litter as well as a decline in bare ground. The ratio of protective cover (vegetation, litter and cryptogams) to bare soil has remained virtually unchanged. In addition, herbaceous cover has increased slightly since 1995. Trend for browse is stable. Density of the key browse species, Wyoming big sagebrush, is stable. Use is heavier, but vigor is normal. Percent decadence remains moderately low at 13%. Trend for the herbaceous understory is mixed. The sum of nested frequency for perennial grasses has increased slightly, while nested frequency of the dominant grass, crested wheatgrass, has increased significantly. Crested wheatgrass provides 96% of the grass cover and 81% of the herbaceous cover. Due to drought conditions, sum of nested frequency for perennial forbs has declined by 53%. Cover of forbs during the same period has declined from 9% in 1995 to 3% in 2000. Perennial forbs provided 45% of the herbaceous cover in 1995. Currently, perennial forbs account for only 15% of the herbaceous cover. Taking all of these factors into consideration, trend for the herbaceous understory is considered down slightly. The Desirable Components Index rated this site as fair to good with a score of 43 due to low browse cover, low decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - slightly down (-1)
winter range condition (DC Index) - fair to good (43) Lower Potential scale

2005 TREND ASSESSMENT

The trend for soil is stable. The ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground remained relatively unchanged from 2000 to 2005. The trend for browse is down. Wyoming big sagebrush, the key browse species decreased from 2,800 plants/acre in 2000 to 1,960 in 2005, a 30% decrease. The strip frequency of sagebrush decreased from 65% in 2000 to 55% in 2005, a 15% decrease. The percent cover only decreased one-half percent, although it continues to be considerably below 5%. Recruitment is low with only 9% of the population classified as young and with 8% classified as dying. Decadence has also increased from 13 to 19%. Winterfat increased some, but not nearly enough to compensate for the losses to sagebrush. The herbaceous understory trend is slightly down. The sum of the nested frequencies of perennial grasses decreased by 14%, where perennial grasses contributes on average to 76% of the herbaceous cover. Forbs remained almost unchanged. The cover of grasses increased slightly and the cover of forbs remained virtually unchanged. The Desirable Components Index rated this site as fair to good with a score of 43 due to low browse cover, low decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - stable (0)
browse - down (-2)
herbaceous understory - slightly down (-1)
winter range condition (DC Index) - fair to good (43) Lower Potential scale

HERBACEOUS TRENDS --
Management unit 17 , Study no: 49

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Agropyron cristatum	$_{ab}$316	$_{a}$260	$_{b}$326	$_{ab}$311	9.44	17.05	19.77
G	Agropyron dasystachyum	$_{a}$6	$_{ab}$21	$_{b}$31	$_{a}$6	.28	.35	.09
G	Agropyron intermedium	$_{a}$-	$_{b}$30	$_{a}$5	$_{a}$-	.12	.03	-
G	Bromus inermis	-	4	2	-	.01	.03	-
G	Carex sp.	$_{a}$-	$_{b}$10	$_{a}$1	$_{a}$-	.04	.00	-
G	Dactylis glomerata	-	8	5	-	.04	.09	-
G	Elymus junceus	-	-	-	5	-	-	.33
G	Oryzopsis hymenoides	-	6	-	2	.06	-	.03
G	Poa fendleriana	-	-	7	-	-	.15	-
G	Poa secunda	-	2	-	-	.03	-	-
G	Secale cereale (a)	-	7	-	-	.06	-	-
G	Stipa comata	-	-	1	-	-	.03	-
Total for Annual Grasses		0	7	0	0	0.06	0	0
Total for Perennial Grasses		322	341	378	324	10.04	17.76	20.22
Total for Grasses		322	348	378	324	10.10	17.76	20.22
F	Agoseris glauca	$_{a}$-	$_{b}$61	$_{a}$-	$_{a}$-	1.92	-	-
F	Allium sp.	-	6	-	4	.02	-	.01
F	Arabis sp.	-	-	3	-	-	.00	-
F	Astragalus convallarius	17	23	6	27	.21	.07	.36
F	Astragalus mollissimus	-	5	4	-	.01	.04	-
F	Astragalus tenellus	1	-	-	3	-	-	.03
F	Calochortus nuttallii	$_{a}$-	$_{b}$7	$_{a}$-	$_{b}$17	.03	-	.04
F	Chaenactis douglasii	-	-	3	-	-	.00	-
F	Chenopodium fremontii (a)	-	7	-	-	.01	-	-
F	Chenopodium leptophyllum(a)	-	$_{b}$10	$_{a}$-	$_{a}$-	.02	-	-
F	Cirsium sp.	-	-	3	-	.15	.00	-
F	Cordylanthus kingii (a)	-	$_{b}$11	$_{a}$-	$_{ab}$5	.08	-	.01
F	Crepis acuminata	-	-	-	2	-	-	.00
F	Cymopterus sp.	-	-	1	3	-	.15	.00
F	Descurainia pinnata (a)	-	5	-	2	.01	-	.01
F	Erigeron eatonii	-	3	-	-	.00	-	-
F	Hedysarum boreale	-	7	5	-	.08	.07	-
F	Lappula occidentalis (a)	-	$_{a}$-	$_{a}$-	$_{b}$16	-	-	.21
F	Lactuca serriola	-	1	-	-	.01	-	-
F	Linum lewisii	-	$_{c}$69	$_{b}$19	$_{a}$-	1.16	.36	-

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
F	Lygodesmia grandiflora	-	3	-	5	.00	-	.09
F	Machaeranthera canescens	$_{b}$21	$_{a}$4	$_{a}$4	$_{a}$7	.03	.03	.12
F	Machaeranthera grindelioides	4	-	-	2	.00	-	.01
F	Melilotus officinalis	$_{a}$-	$_{b}$16	$_{a}$3	$_{a}$-	.32	.15	-
F	Penstemon humilis	10	11	8	3	.65	.05	.15
F	Phlox hoodii	$_{c}$101	$_{b}$35	$_{b}$38	$_{a}$5	.43	.96	.19
F	Phlox longifolia	$_{b}$70	$_{b}$76	$_{a}$20	$_{b}$53	.29	.13	.55
F	Sanguisorba minor	$_{a}$-	$_{b}$28	$_{a}$2	$_{a}$-	.21	.03	-
F	Sphaeralcea coccinea	$_{b}$183	$_{b}$166	$_{ab}$152	$_{a}$117	2.40	.98	1.02
F	Tragopogon dubius	4	8	-	-	.18	-	-
F	Trifolium gymnocarpon	$_{a}$8	$_{bc}$46	$_{ab}$33	$_{c}$68	.19	.17	1.19
Total for Annual Forbs		0	33	0	23	0.12	0	0.22
Total for Perennial Forbs		419	575	304	316	8.34	3.24	3.79
Total for Forbs		419	608	304	339	8.47	3.24	4.02

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 17 , Study no: 49

Type	Species	Strip Frequency			Average Cover %		
		'95	'00	'05	'95	'00	'05
B	Artemisia tridentata wyomingensis	50	65	55	2.61	3.95	3.40
B	Atriplex canescens	0	1	0	-	-	-
B	Ceratoides lanata	9	6	9	.03	.18	.18
B	Chrysothamnus depressus	2	2	0	.01	-	-
B	Chrysothamnus nauseosus hololeucus	3	5	1	.03	.03	.00
B	Chrysothamnus viscidiflorus viscidiflorus	54	61	56	1.96	2.41	2.04
B	Eriogonum corymbosum	71	72	70	1.45	2.00	2.38
B	Gutierrezia sarothrae	1	4	16	-	.03	.28
B	Kochia prostrata	0	0	8	-	-	.03
B	Opuntia sp.	15	14	3	.01	.00	.00
B	Pinus edulis	0	1	1	-	-	-
Total for Browse		205	231	219	6.11	8.63	8.34

CANOPY COVER, LINE INTERCEPT --
Management unit 17 , Study no: 49

Species	Percent Cover '05
Artemisia tridentata wyomingensis	4.11
Ceratoides lanata	.28
Chrysothamnus nauseosus hololeucus	.05
Chrysothamnus viscidiflorus viscidiflorus	2.78
Eriogonum corymbosum	2.66
Gutierrezia sarothrae	.56
Kochia prostrata	.18

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 17 , Study no: 49

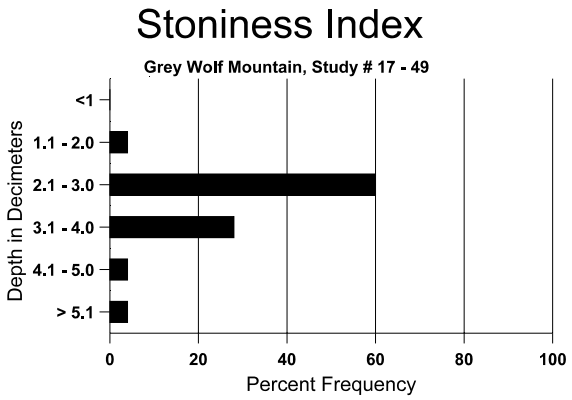
Species	Average leader growth (in) '05
Artemisia tridentata wyomingensis	1.5

BASIC COVER --
Management unit 17 , Study no: 49

Cover Type	Average Cover %				
	'82	'88	'95	'00	'05
Vegetation	0	8.00	23.68	30.28	29.74
Rock	0	0	0	.00	0
Pavement	0	0	0	.11	.04
Litter	0	36.00	21.52	33.00	23.30
Cryptogams	0	6.25	.23	.49	.90
Bare Ground	53.50	49.75	54.37	58.32	56.52

SOIL ANALYSIS DATA --
Herd Unit 17, Study # 49, Study Name: Grey Wolf Mountain

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	ppm P	ppm K	dS/m
15.5	60.2 (16.6)	7.5	42.9	26.8	30.3	2.1	3.6	204.8	0.7



PELLET GROUP DATA --
Management unit 17 , Study no: 49

Type	Quadrat Frequency		
	'95	'00	'05
Rabbit	2	1	6
Elk	7	15	32
Deer	11	25	14
Cattle	1	2	7

Days use per acre (ha)	
'00	'05
-	-
13 (31)	47 (116)
34 (84)	58 (144)
6 (14)	15 (26)

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 49

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
82	**1265**	1133	133	1066	66	-	42	5	5	-	5	23/27
88	**6466**	5600	4733	1533	200	-	14	11	3	-	10	20/17
95	**2300**	180	1040	1040	220	780	14	3	10	5	5	15/20
00	**2800**	40	820	1620	360	420	39	21	13	1	1	15/22
05	**1960**	80	180	1400	380	740	35	35	19	8	8	16/21
Atriplex canescens												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**20**	-	-	20	-	-	100	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	-/-

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Ceratoides lanata												
82	**332**	-	66	266	-	-	40	0	0	-	0	8/8
88	**199**	-	66	133	-	-	0	67	0	-	0	7/7
95	**360**	-	20	340	-	-	22	0	0	-	0	10/12
00	**220**	-	-	220	-	-	18	55	0	-	0	5/9
05	**320**	-	-	300	20	-	56	44	6	6	6	10/12
Chrysothamnus depressus												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**40**	-	20	20	-	-	0	0	-	-	0	6/8
00	**40**	-	-	40	-	-	0	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus hololeucus												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**60**	-	40	20	-	-	0	0	-	-	0	17/14
00	**280**	-	80	200	-	-	0	0	-	-	0	9/14
05	**20**	-	20	-	-	-	0	0	-	-	0	13/21
Chrysothamnus viscidiflorus viscidiflorus												
82	**1933**	-	-	1933	-	-	0	0	0	-	0	10/12
88	**3533**	400	933	1200	1400	-	21	4	40	-	9	7/5
95	**3200**	20	560	2640	-	-	1	0	0	-	0	11/14
00	**2960**	20	100	2840	20	-	0	0	1	-	0	7/12
05	**2540**	20	260	2240	40	20	5	6	2	2	2	10/14
Eriogonum corymbosum												
82	**2533**	-	-	2533	-	-	37	0	0	-	16	13/15
88	**3466**	66	400	1866	1200	-	33	13	35	-	0	14/13
95	**2960**	100	560	2400	-	-	0	0	0	-	0	14/16
00	**2760**	40	180	2520	60	-	0	0	2	.72	.72	12/16
05	**3020**	60	680	2200	140	-	15	4	5	3	3	12/16
Gutierrezia sarothrae												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**399**	-	-	266	133	-	0	0	33	5	17	8/8
95	**20**	-	-	20	-	-	0	0	0	-	0	-/-
00	**120**	-	-	120	-	-	0	0	0	-	0	6/9
05	**840**	-	60	780	-	-	0	0	0	-	0	6/7

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Kochia prostrata												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**0**	-	-	-	-	-	0	0	-	-	0	-/-
05	**480**	420	360	120	-	-	13	4	-	-	0	9/18
Opuntia sp.												
82	**600**	-	-	600	-	-	0	0	0	-	0	3/7
88	**732**	600	133	266	333	-	0	0	45	-	0	4/10
95	**360**	-	40	320	-	20	0	0	0	-	0	4/6
00	**300**	20	-	280	20	-	0	0	7	-	0	3/3
05	**80**	-	20	60	-	-	0	0	0	-	0	4/8
Pinus edulis												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**20**	-	20	-	-	-	0	0	-	-	0	-/-
05	**20**	-	20	-	-	-	0	0	-	-	0	-/-